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OTHER TRANSACTION AGREEMENT DTRS56-02-T-0001, SwRI® PROJECT 14.06162

"APPLICATION OF REMOTE-FIELD EDDY CURRENT (RFEC) TESTING TO INSPECTION OF UNPIGGABLE PIPELINES"

Many pipelines contain internal restrictions that do not allow the passage of inspection pigs that use conventional inspection technology. The purpose of this project is to investigate the feasibility of a remote-field eddy current (RFEC) inspection method that utilizes either a unique collapsible excitation coil or a small rigid excitation coil that can pass through internal pipeline restrictions.

Task 2, RFEC Coil Design, involves the modeling and design of RFEC coils to accommodate the size constraints imposed by internal restrictions. Concepts for a collapsible excitation coil were shown in the first status report. This cost is composed of six hinged segments, each consisting of an individual coil. Before proceeding with fabrication of this segmented coil, a single RFEC coil of conventional design (e.g. one coil of a diameter slightly smaller than the inside diameter of the pipe) was designed and fabricated for use in a 12-inch-diameter pipe specimen. Based on results with the single coil, design of a segmented coil and hinge mechanism was completed. Coils are currently being wound on the segments so that testing can be initiated.

Task 3, Breadboard System, involves development of a laboratory breadboard RFEC system and preparation of a test specimen. In this task, a laboratory breadboard RFEC system was designed and fabricated, and a test specimen was prepared, as described in previous reports. The segmented coil and hinge arrangement was configured for use with the breadboard system and test specimen.

In Task 4, RFEC Evaluation, the RFEC breadboard system with the full-size conventional coil was evaluated in the 12-inch-diameter pipe test specimen. The system was pulled manually through the pipe, and experimental data were digitized as a function of axial position using an encoder arrangement. Experiments were performed at frequencies ranging from 10 to 100 Hz, with 10 Hz providing the best results. The lower frequency is needed to obtain sufficient electromagnetic skin depth to penetrate the thick pipe wall (0.375 inch). All three flaws were detected; the flaws are all 2 inches in diameter with depths of 25, 50, and 75 percent of the pipe wall thickness. Based on the experimental parameters used [e.g. frequency and coil excitation values (ampere-turns)], sufficient information was obtained to proceed with design of the segmented coils, as described in Task 2.

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